

Claims

- [c1] An electric discharge machining sampling apparatus for obtaining samples from a surface of metal components, said apparatus operable underwater and comprising:
a base plate;
an electrode assembly movably coupled to said base plate, said electrode assembly comprising an electric discharge electrode and an electrode holder, said electrode comprising at least one bore extending therethrough; and
a particle collection assembly operatively coupled to said electrode, said at least one electrode bore in flow communication with said particle collection assembly.
- [c2] An apparatus in accordance with Claim 1 further comprising a motor and an electrode drive mechanism operatively coupled to said motor and said electrode assembly.
- [c3] An apparatus in accordance with Claim 2 wherein said electrode drive mechanism is configured to move said electrode assembly along a plane substantially perpendicular to the surface of a component.
- [c4] An apparatus in accordance with Claim 1 further comprising an alignment bracket coupled to said base plate.
- [c5] An apparatus in accordance with Claim 4 wherein said alignment bracket comprises at least three leveling studs.
- [c6] An apparatus in accordance with Claim 1 further comprising a positioning assembly coupled to said base plate.
- [c7] An apparatus in accordance with Claim 6 wherein said positioning assembly comprises a support bracket coupled to said base plate and a means for coupling said sampling apparatus to a component.
- [c8] An apparatus in accordance with Claim 7 wherein said means for coupling said sampling apparatus to a component comprises at least two suction cups coupled to said support bracket.

- [c9] An apparatus in accordance with Claim 1 wherein said particle collection assembly comprises a filter element positioned in a filter housing, said filter housing operatively coupled to a vacuum source.
- [c10] An electric discharge machining sampling apparatus for obtaining samples from a surface of components in a nuclear reactor, said apparatus operable underwater and comprising:
a base plate;
an electrode assembly movably coupled to said base plate, said electrode assembly comprising an electric discharge electrode and an electrode holder, said electrode comprising at least one bore extending therethrough; and
a particle collection assembly operatively coupled to said electrode, said at least one electrode bore in flow communication with said particle collection assembly, said particle collection assembly comprising a filter element positioned in a filter housing, said filter housing operatively coupled to a vacuum source.
- [c11] An apparatus in accordance with Claim 10 further comprising a motor and an electrode drive mechanism operatively coupled to said motor and said electrode assembly, said electrode drive mechanism configured to move said electrode assembly along a plane substantially perpendicular to the surface of a reactor component.
- [c12] An apparatus in accordance with Claim 10 further comprising an alignment bracket coupled to said base plate, said alignment bracket comprising at least three leveling studs.
- [c13] An apparatus in accordance with Claim 10 further comprising a positioning assembly coupled to said base plate.
- [c14] An apparatus in accordance with Claim 13 wherein said positioning assembly comprises a support bracket coupled to said base plate and a means for coupling said sampling apparatus to a reactor component.
- [c15] An apparatus in accordance with Claim 14 wherein said means for coupling said sampling apparatus to a reactor component comprises at least two suction cups

coupled to said support bracket.

- [c16] A method of performing in-situ sampling of metal surfaces of components in a nuclear reactor, said method comprising:
- positioning an electric discharge machining sampling apparatus adjacent a metal surface of a reactor component in the reactor;
 - activating the sampling apparatus to produce a debris of particles from the surface of the reactor component; and
 - collecting the particle debris, the electric discharge machining sampling apparatus comprising:
 - a base plate;
 - an electrode assembly movably coupled to the base plate, the electrode assembly comprising an electric discharge electrode and an electrode holder, the electrode comprising at least one bore extending therethrough; and
 - a particle collection assembly operatively coupled to the electrode, the at least one electrode bore in flow communication with the particle collection assembly.
- [c17] A method in accordance with Claim 16 wherein the sampling apparatus further comprises a positioning assembly coupled to the base plate, positioning assembly comprising a support bracket coupled to the base plate and a means for coupling the sampling apparatus to a reactor component, and positioning an electric discharge machining sampling apparatus adjacent a metal surface of a reactor component in the reactor comprises locating the sampling apparatus adjacent the reactor component and coupling the sampling apparatus to the reactor component.
- [c18] A method in accordance with Claim 17 wherein the sampling apparatus further comprises a motor and an electrode drive mechanism operatively coupled to the motor and the electrode assembly, the electrode drive mechanism configured to move the electrode assembly along a plane substantially perpendicular to the surface of a reactor component, and positioning an electric discharge machining sampling apparatus adjacent a metal surface of a reactor component in the reactor comprises activating the electrode drive mechanism to position the electrode a predetermined distance from the surface of the reactor component.

- [c19] A method in accordance with Claim 17 wherein the sampling apparatus further comprises an alignment bracket coupled to the base plate, the alignment bracket comprises at least three leveling studs, and positioning an electric discharge machining sampling apparatus adjacent a metal surface of a reactor component in the reactor comprises coupling the sampling apparatus to the reactor component so that the at least three leveling studs engage the surface of the reactor component.
- [c20] A method in accordance with Claim 16 wherein the sampling apparatus further comprises a filter element positioned in a filter housing, the filter housing operatively coupled to a vacuum source, and collecting the particle debris comprises directing the particle debris through the electrode bores and into the filter housing and onto the filter element.
- [c21] A method in accordance with Claim 20 wherein directing the particle debris through the electrode bores comprises applying a vacuum to the particle collection assembly to flow water and particle debris through the at least one electrode bore and into the filter housing and onto the filter element.
- [c22] A method in accordance with Claim 16 further comprising controlling the amount of metal removed from the surface of the reactor component by controlling current and voltage inputs to the electric discharge machining apparatus.
- [c23] A method in accordance with Claim 22 wherein controlling current and voltage inputs comprises pulsing the current and voltage inputs with variable amplitude, pulse frequency, and pulse duration.